BATS OF WYOMING

YEAR 4 REPORT

2014

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Table of Contents

Contents

EXECUTIVE SUMMARY

The Black Hills and Bear Lodge Mountains of northeastern Wyoming and western South Dakota represent an area of high biological diversity and support a large and diverse bat population. While many bat species are known to occur in the region, we focused our efforts on obtaining data specific to Northern Long-eared Myotis (*Myotis septentrionalis*). Basic knowledge of habitat use and associations of Northern Myotis in Wyoming is limited. Across its range, Northern Myotis is strongly associated with deciduous and coniferous forest habitats. In Wyoming, the species is only known from areas dominated by Ponderosa Pine forest. Northern Myotis was petitioned for listing under the Endangered Species Act in 2010. The primary factor threating the species cited in the petition was the large impact of White-Nose Syndrome (WNS) to the species throughout a large portion of its range in eastern North America. In April of 2015, USFWS determined the species warranted threatened species status. The threatened status indicates that the species in imminent danger of becoming endangered to the threat of extinction throughout a significant portion or its entire range.

Our study area in 2014 encompassed a large portion of northeastern Wyoming and included portions of the Buffalo and Newcastle Field Offices of the BLM (Figure 1) where Northern Myotis is known or suspected to occur in Wyoming. We conducted both mist net and acoustic surveys. At acoustic survey locations, we collected extensive habitat data to characterize forest structure at these sites. Using acoustic data and habitat data collected at acoustic sites, we estimated occupancy probability for all bat species with sufficient detections.

The primary goal of this project is to better understand the distribution and habitat associations of bats in northeastern Wyoming with a specific emphases on Northern Myotis. Specific objectives for this multi-year project included:

1. **Inventory bats occurring throughout northeastern Wyoming.**
2. **Estimate detection probability and occupancy rates as they relate to habitat covariates for all bats detected via acoustic monitoring throughout the study area.**
3. **Identify important habitat characteristics that influence occupancy of bat species, especially Northern Long-eared Myotis throughout the study area.**
4. **Identify areas that are likely to be occupied by Northern Long-eared Myotis in northeastern Wyoming.**
5. **Document evidence of White-nose Syndrome in Wyoming.**

In 2014, we conducted 11 mist net surveys and 72 acoustic surveys. We captured 105 bats representing 9 species in mist nets. The most commonly captured species was the Little Brown Myotis, with 27 captures. We captured 23 Northern Myotis across five sites, including four pregnant females, which suggests that Northern Myotis is relatively common in suitable habitat. Other commonly captured species included Silver-haired Bat, Long-legged Myotis, and Big Brown Bat. Overall, sex ratios were skewed towards males (90 males: 15 females). From acoustic surveys, we obtained a total of 4,134 recordings that could be classified to species. These recordings represented 11 species. The most frequently detected species was the Little Brown Myotis followed by Silver-haired Bat and Hoary Bat. Northern Myotis was infrequently detected during acoustic surveys with detections at only nine sites. Two species known to occur within the study area, Fringed Myotis and Townsend's Big-eared Bat, were documented from acoustic recordings alone.

We were able to conduct occupancy analyses for nine of the eleven bat species detected in 2014. We used a two-step occupancy modeling approach. First, we identified the best model for estimating the detection probability of each bat species. Second, using the best detection function and habitat covariates, we identified the best model for estimating the occupancy probability for each bat species. The best detection function for most species did not include any covariates, indicating that detection did not vary with the covariates included in our detection models. Three species included at least one climactic or temporal covariate in the top detection function. The probability of detecting Eastern Red Bat was higher when the minimum temperature was higher than average and at later

Julian dates. The probability of detecting both Hoary Bat and Townsend's Big-eared Bat was higher at later Julian dates. In our occupancy analysis, the top model for Hoary Bat, Little Brown Bat, Silver-haired Bat, Townsend's Big-eared Bat, and Western Long-eared Myotis was the null model. The highest ranked model for Big Brown Bat and Eastern Red Bat contained the density and Diameter at Brest Height (DBH) of dead trees (dead tree model). The highest ranked model for Western Small-footed Myotis included the DHB of both live and dead trees (DBH model).

For our focal species, the Northern Myotis, the highest ranked model contained covariates for the density and DBH of live trees (live tree model) and suggests that the probability of occupancy increased with the density of live trees and with the DBH of live trees. The DBH model was the second ranked model and also had considerable support. This model suggested that occupancy increased with increasing DHB of both live and dead trees. Both of these models align with our expectations of Northern Myotis being a forest obligate species frequently found in relatively dense forests and frequently roosting in relatively large dead or live trees.

All occupancy models presented in this report are preliminary and require further evaluation. Caution should be used in interpreting these results. In future analyses, we plan to utilize multi-method models using the two site-level microphones in a duel-observer framework. For most species, multiple models had considerable support. Using a model averaging approach in the future may provide more robust results.

White-nose Syndrome is a fungal disease that has caused significant declines in bat populations in eastern North America. The disease has spread great distances since first observed in 2006 and may eventually affect the entire content, including Wyoming. Examination of the membranes of both wings and uropatagium of bats captured in 2014 did not reveal any evidence of WNS infection.

Other products presented in this report include a map of our study area and survey locations (Figure 1), and mist net capture and acoustic data (Appendices 1 and 2). This report summarizes efforts of the fourth year of an ongoing study to enhance our understanding of the distribution of bats across Wyoming. However, 2014 marked the first year of survey activity in northeast Wyoming. Survey efforts in 2015 will follow similar survey methods, and will also focus on the Northern Long-eared Myotis. We hope to increase our sample size and further our understanding of important habitat features for this species, and will continue to document occurrences of all bat species. This information will be used to improve our understanding of Northern Myotis in Wyoming.

INTRODUCTION

Bats are an important component of ecosystems worldwide. They are integral pollinators and seed-dispersers for many plant species. Bats also consume large quantities of insects, many of which cause significant agricultural losses and threaten human health (Kunz and Parsons 2009). It is estimated that in North America alone, bats prevent $3.7 billion in damage to agricultural resources each year (Boyles et al. 2011). Unfortunately, many bat species have undergone large population declines and are faced with increasing risks of extinction. For example, of the 47 bat species known to occur in the United States, six are currently listed as "Endangered" and one is listed as "Threatened" under the Endangered Species Act (ESA) and at least one other species is under an active petition for ESA protections (Harvey et al. 2011, United States Fish and Wildlife Service 2011;2013). Observed population declines across the globe have many causes including habitat loss and alteration, disease, and renewable energy development.

The Black Hills and Bear Lodge Mountains of northeastern Wyoming and western South Dakota represent an area of high biological diversity. The region serves as a unique biogeographic refugia for many plant and animal species typical of the Rocky Mountains, Great Basin, eastern deciduous forest, boreal forest, and southern Great Plains bioregions (Knight et al. 2014). This biological diversity coupled with diverse habitat types and landscape features allows for uniquely diverse bat species assemblages throughout the region. At least 11 bat species are known to reside in the Black Hills region of Wyoming and South Dakota (Tigner and Stukel 2003).

While many bat species are known to occur in our study area, we focused our efforts on obtaining data specific to Northern Long-eared Myotis (*Myotis sepetentironalis*; also commonly referred to as Northern Long-eared Bat or NLEB, and Northern Myotis). The species is a small vespertilionid bat but is medium in size among *Myotis* species. Dorsal pelage is dull yellow-brown while ventral pelage is pale gray. Wing and tail membranes are translucent and light brown (Bogan et al. 2005). The calcar often has a slight keel. The ears are relatively long (17-19 mm) and have a distinct long, pointed tragus (Caceres and Barclay 2000). Northern Myotis is widely distributed across central and eastern Canada and the midwestern and eastern United States. It is generally considered an eastern species and is thought to be quite rare in the western portions of its distribution. Wyoming is on the extreme western edge of the species range. In Wyoming, the species has only been documented in the northeastern corner of the state in the vicinity of the Bear Lodge Mountains and Black Hills. Prior to our work in 2014, the WYNDD database contained only 11 records of the species in Wyoming (Wyoming Natural Diversity Database 2015).

Basic knowledge of habitat use and associations of Northern Myotis in Wyoming is limited. Across its range, Northern Myotis is strongly associated with deciduous and coniferous forest habitats. In Wyoming, the species is only known from areas dominated by Ponderosa Pine forest. The species frequents a wide variety of day and night roosts during the summer. Trees are most frequently used as roosts. Specifically, tall, large diameter trees are preferred across the species range though maternity colonies may also include roosts such as human-made structures and buildings (Caceres and Barclay 2000). Roost preference has not been evaluated in Wyoming but in the Black Hills of South Dakota Northern Myotis typically roosted in the largest snags available and roost trees were generally highly decayed (Cryan et al. 2001). Northern Myotis hibernates in caves and abandoned mines during the winter (Caceres and Barclay 2000). To date, there are no known hibernacula for the species in Wyoming but they are known to hibernate east of the study area in South Dakota. Within the hibernacula, Northern Myotis often cluster in deep crevices. Evidence suggests that summer habit is generally fairly close to winter hibernacula (less than 56 km) (Caceres and Barclay 2000).

Northern Myotis was petitioned for listing under the Endangered Species Act in 2010. The primary factor threating the species listed in the petition was the large impact of WNS to the species throughout a large portion of its range in eastern North America. In 2011, the United States Fish and Wildlife Service issued a positive 90-day finding indicating substantial evidence was presented within the 2010 petition. A 12-month status review was initiated in 2011 (United States Fish and Wildlife Service 2011). In 2013, USFWS published the results of this status review and proposed the species be listed as endangered under the ESA (United States Fish and Wildlife Service 2013). In April of 2015, USFWS determined the species warranted threatened species status. The threatened status indicates that the species in imminent danger of becoming endangered to the threat of extinction throughout a significant portion or its entire range. The USFWS also implemented a 4(d) rule for areas where WNS does not currently affect the species, which includes all areas where the species occurs in Wyoming. The 4(d) rule exempts lawful incidental take of the species in these areas and is intended to provide flexibility for activities that may affect the species in the area covered under this rule.

As specified in the original petition, WNS is the primary threat to the persistence of Northern Myotis in North America. The disease is also an emerging issue for many bat species in North America. The disease is caused by the fungal pathogen *Pseudogymnoacus destructans* (formerly *Geomyces destructans*) and affects hibernating bats (Lorch et al. 2011). The disease was first noted in New York in 2006. Since that time, an estimated 5.7 million bats have died from WNS (Bat Conservation International 2013). In affected areas, mortality rates of up to 100% have been documented (Frick et al. 2010). The disease continues to spread across the eastern and southeastern US and has been detected as far west as Iowa. To date, bats in western North American have not been affected. It is thought that WNS may eventually occur across North America but it is unknown if the disease will affect bats in warmer or drier climates that occur in the western United States to the degree it has in eastern North America. Our work also serves to provide a baseline for bat health as well as to monitor for signs of WNS in Wyoming. Early detection of the disease may help to reduce the scale of effects and transmission in the state (Abel and Grenier 2011).

Occupancy modeling is a commonly applied method for estimating the probability of a species being present at site when the probability of detecting the species is less than one (MacKenzie et al. 2002). Across a study area, occupancy modeling allows researchers to estimate the proportion of sample units occupied by a species and to develop and evaluate predictive models that incorporate habitat covariates using an information theoretic approach (MacKenzie 2006). Many researches have applied occupancy modeling techniques to understand how local habitat features influence the distribution of bat species on the landscape (Yates and Muzika 2006, Gorresen et al. 2008, Weller and Baldwin 2012).

In order to provide land managers a better understanding of bat distributions and habitat associations, especially for Northern Myotis, in northeastern Wyoming, we conducted an extensive inventory of bats and their habitats during the summer of 2014. We accomplished this by implementing mist net surveys, acoustic surveys, and conducted extensive habitat surveys. Using acoustic and habitat data collected at acoustic survey locations we used occupancy models in an effort to better understand site-scale habitat characteristics that are important for the occupancy of several bat species, including Northern Myotis.

Study Objectives

Funding for this project was provided by the Wyoming Office of the BLM. All reports, maps, and data are freely available to the public. This work will provide information allowing the BLM to fulfill multiple-use mandates on lands it manages as well provide data aiding in land management and resource development decisions the agency is responsible for. This report details the results of the fourth year of a multi-year research effort to enhance our understanding bat distribution in Wyoming. Previous work was conducted in 2011, 2012, and 2013 in southern Wyoming in areas likely to be developed for wind energy. In these years, the primary focus was developing and validating predictive species distribution models that would inform placement of wind energy facilities in that part of Wyoming. In 2014, we generated state-wide predictive distribution models for most bats that reside in Wyoming. These models can be found in an additional report on the WYNDD website. However, work highlighted in this report marks the first year of work in northeastern Wyoming and work was targeted on enhancing our understanding of the distribution and habitat associations of Northern Myotis in the state. We will continue work in this part of Wyoming in 2015 following a similar framework as presented below. Objectives of this multi-year research effort are:

1. **Inventory bats occurring throughout northeastern Wyoming.**
2. **Estimate detection probability and occupancy rates as they relate to habitat covariates for all bats detected via acoustic monitoring throughout the study area.**
3. **Identify important habitat characteristics that influence occupancy of bat species, especially Northern Long-eared Myotis throughout the study area.**

4. **Identify areas that are likely to be occupied by Northern Long-eared Myotis in northeastern Wyoming.**
5. **Document evidence of White-nose Syndrome in Wyoming.**

METHODS

Study Area

Our study area in 2014 encompassed a large portion of northeastern Wyoming and encompassed portions of the Buffalo and Newcastle Field Offices of the BLM (Figure 1). The study area included portions of the Powder River Basin to the west and the Bear Lodge Mountains and Black Hills to the east. The Powder River Basin is dominated by sagebrush steppe, short grass prairie, and badlands though many ridgelines are covered by ponderosa pine and Rocky Mountain juniper and riparian corridors contain plains cottonwood. The mountainous areas to the east are dominated by forested habitats, primarily ponderosa pine but also burr oak, aspen, American elm, boxelder, paper birch, and white spruce (Knight et al. 2014). Forested areas are interspersed with grasslands and shrub steppe. Elevations ranged from approximately 1,000 m to 1,950 m.

Field Surveys

Sites included in our occupancy analyses were selected using a spatially-balanced sampling algorithm (details below) to provide an unbiased sample across the entire study area (Figure 1). We trained and deployed one crew of two people from July 9 to September 22, 2014. We conducted two types of surveys: active mist-netting and passive acoustic monitoring. Capturing live bats with mist nets allowed us to verify species presence, inspect individuals for disease, assess physical condition, and collect demographic information. Passive surveys allowed us to efficiently collect species presence information from multiple sites each night.

Mist Net Surveys

Potential mist net sites were identified using aerial imagery from the 2012 National Agriculture Imagery Program (United States Department of Agriculture Farm Service Agency Aerial Photography Field Office 2012). Potential sites included small reservoirs, natural ponds, streams, rivers, and springs that could be identified from NAIP imagery. While in the field, surveyors evaluated potential sites and conducted a mist net survey at appropriate sites.

At suitable mist net sites, combinations of 6, 9, 12, and 18 m mist nets[1] were suspended over water between aluminum poles in single-high arrangements to catch bats while feeding or drinking. Mist nets were opened at civil sunset unless non-target taxa (e.g. birds) were active at the site. In this case, nets were opened as soon as bird activity ceased. Nets were checked for captures at least every 15 minutes and captures were removed from nets immediately to minimize injury, drowning, strangulation, or stress associated with being in the net. Experienced and well trained surveyors removed bats from nets with great care to protect wing bones and patagia. If large numbers of bats were captured, nets were closed to ensure that all captures were removed from nets, processed, and released within 30 minutes of capture. Nets were not set in high winds or temperatures below 40ºF to minimize bat stress and injury. If these conditions occurred during a survey, the survey was discontinued. Once removed from the net captures were placed in a cloth bag for transport and processing to minimize stress. Captured bats were measured (forearm length, ear length), weighed, sexed, aged, identified to species and released on site.

Additionally, the membranes of both wings and the uropatagium of each captured bat were inspected following the methods presented by Reichard and Kunz (2009). After each survey, we decontaminated all survey equipment and supplies following the National White-Nose Syndrome Decontamination Protocol Version 06.25.2012 (2012). We also followed all guidelines laid out in the Wyoming White-Nose Strategic Plan (Abel and Grenier 2011).

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[1] Avinet bat-specific mist nets, 38mm mesh, black polyester, Dryden, NY, www.Avinet.com

At each mist net survey site, acoustic monitoring equipment was also deployed to detect any additional bat species present but not captured in nets. We used Echo Meter 3[2] acoustic monitoring equipment at mist net sites. Recordings made using the Echo Meter 3 were analyzed using SonoBat 3 Mountains and Plains Species Package[3] (details in Acoustic Surveys section below).

Acoustic Surveys

Acoustic survey locations were selected using a spatially balanced sampling algorithm in Program R using the R package SDraw (Robertson et al. 2013). Within SDraw, we used the Equi-probable Design option and selected samples using the Balanced Acceptance Sampling (BAS) algorithm. From the samples drawn, we used a GIS to select the highest ranked (first drawn) samples that were on publicly accessible public land (surface owned by either BLM, Black Hills National Forest, State of Wyoming, or Thunder Basin National Grassland) with any forest cover. We selected sites with forest cover because one primary objective of this work was to enhance our understanding of the distribution and habitat associations of Northern Long-eared Myotis in Wyoming. However, we present data on all bat species identified at acoustic survey locations.

Acoustic surveys were conducted using Wildlife Acoustics Song Meter SM2BAT+[4] full-spectrum recording equipment. Two microphones were attached to each recorder. One SMX-US[5] ultrasonic microphone was attached to a 3 m cable and placed between 1 m and 2 m above the ground. One SM3[6] ultrasonic microphone was attached to a SM3 to SM2 converter[7] and a 50 m cable and placed approximately 50 m in a randomly selected direction form the recording unit and 1 m to 2 m above the ground. Units were programed to begin recording one half hour before civil sunset and to stop recording one half hour after civil sunrise. We recorded for at least three consecutive nights at each survey location. All calls were analyzed using the Sonobatch automated call analysis algorithm in the SonoBat 3 Mountains and Plains Species Package. We used an acceptable call quality threshold of 0.70 and a discriminate probability threshold of 0.90.

Habitat Surveys

We collected extensive habitat data to characterize forest structure and understory characteristics at acoustic monitoring sites. These data were then used as covariates in our occupancy modeling analysis to explain variation in occupancy and detection probabilities related to habitat characteristics across our study area. Habitat data collection occurred at two scales: at the site scale and at the home range scale (Figure 2).

Site-Scale Plots

We surveyed two site-scale plots at each acoustic survey location. One site-scale plot was centered on the randomly selected acoustic locations and one site-scale plot was centered on the location of the ultrasonic microphone placed 50 m in a random direction form the acoustic survey location. Site-scale plots consisted of 25 m radius circular plots. Within each plot, we established three 25 m by 2 m belt transects. From the plot center, we used a table of randomly generated compass bearings to select the direction of the first belt transect. Two subsequent belt transects were oriented at 120° and 240° from the first. At the plot center, we recorded the slope, slope position, and aspect (Table 1), and if determinable, the distance to the nearest standing water, flowing water, and travel corridors (e.g. road, trail, or stream corridor). Along each belt transect, we recorded data for live overstory trees, live understory trees and shrubs, and dead standing trees (i.e. snags), canopy cover, canopy height, and ground cover. For each tree or shrub stem that intersected a belt transect we recorded the status (Live standing overstory, dead standing overstory, live standing understory, dead standing understory; Table 2), species, and Diameter at Breast Height (DBH) using a Biltmore stick. If the status of the tree was either dead standing

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[2] Echo Meter 3 Active ultrasonic monitoring unit, Concord, MA, www.wildlifeacoustics.com
[3] SonoBat 3, Wyoming species package, Arcata, CA, www.sonobat.com (Szewczak 2011)
[4] Song Meter SM2Bat+ ultrasonic monitoring unit, Concord, MA, www.wildlifeacoustics.com
[5] SMX-US ultrasonic microphone, Concord, MA, www.wildlifeacoustics.com
[6] SM3 ultrasonic microphone, Concord, MA, www.wildlifeacoustics.com
[7] SM3 to SM2 microphone converter, Concord, MA, www.wildlifeacoustics.com

overstory or dead standing understory, we determined the height and decay class (Table 3; Figure 3). Because many of belt transects intersected few snags, we recorded data for all snags within each 25 m plot. We measured canopy cover using a spherical densiometer. Canopy cover readings were taken in each cardinal direction at the plot center and at distances of 12.5 m and 25 m from the start of the belt transect. We measured canopy height using a laser range finder by measuring the distance from the observer to the trunk at eye level and the distance to the top of the tree. Heights were calculated using the Pythagorean Theorem and adding the height of the observer. We measured the heights of five trees representative of the stand at the plot center and at distances of 12.5 and 25 m from the start of the belt transect. We also estimated ground cover composition using a 2 m length of PVC. Ground cover readings were taken along each belt transect at distances of 12.5 M and 25 M. We centered the pipe perpendicular to the center of the belt transect and estimated the percent (to the nearest 5%) of the leading edge of the PVC pipe that intersected shrub, grass, forb, coarse woody debris, litter, rock, or bare soil.

Home Range-Scale Plots

In a GIS, we generated 200 m radius circles centered on each randomly selected acoustic monitoring location. We selected 200 m radius circles because this approximates the home range size of Northern Myotis. Within each home range polygon, we randomly placed six 50 m by 2 m belt transects oriented in a random direction. Due to time limitations, we were only able to sample three line transects in a subset of home range plots. At the transect starting point, 12.5 m, 25 m, and 50 m, we recorded the slope, slope position (Table 1), aspect, and if determinable, the distance to the nearest standing water, flowing water, and travel corridors (e.g. road, trail, or stream corridor). Along each belt transect, we recorded data for live overstory trees, live understory trees and shrubs, and dead standing trees (i.e. snags), canopy cover, and canopy height. For each tree or shrub stem that intersected a belt transect we recorded the status (Live standing overstory, dead standing overstory, live standing understory, dead standing understory; Table 2), species, and Diameter at Breast Height (DBH) using a Biltmore stick. If the status of the tree was either dead standing overstory or dead standing understory, we determined the height and decay class (Table 3; Figure 3). We measured canopy cover using a spherical densiometer. Canopy cover readings were taken in each cardinal direction at the transect starting point and 12.5 m, 25 m, and 50 m from the start of the belt transect. We measured canopy height using a laser range finder by measuring the distance from the observer to the trunk at eye level and the distance to the top of the tree. Heights were calculated using the Pythagorean Theorem and adding the height of the observer. We measured the heights of five trees representative of the stand at the transect starting point and 12.5 m, 25 m, and 50 m from the start of the belt transect.

Occupancy Analysis of Bat Species

Occupancy analyses were run in the Program R package RPresence, an R interface for Program PRESENCE (MacKenzie and Hines 2014). We used the “occ.mod.so” function in RPresence, which is equivalent to the “Simple Single-Season” model in Program PRESENCE. For occupancy models presented in this report, we pooled acoustic detections at our two site-scale plots. Our two site-scale plots could not be used as independent sites because they were spatially correlated. We treated each night of recording at our pooled site-scale plots as a survey. We estimated both occupancy and detection probability as a function of site (habitat) covariates and survey (weather and Julian date) covariates respectively (Table 6). All covariates were standardized so that the mean was zero. We used a two-step modeling approach to first optimize the detection probability and then estimate occupancy probability for each species (MacKenzie 2006, Yates and Muzika 2006). First, to incorporate detection probability for each species properly, we compared 8 *a priori* models containing covariates that likely influenced the ability to detect a bat species using AIC (Yates and Muzika 2006). Covariates included in these models were used to optimize the detection probability for each species and included the survey covariates of minimum temperature for each survey night, if any measureable precipitation fell on each survey night, and the Julian date of each survey night. Minimum temperature and precipitation data were obtained from the Sundance, WY National Oceanic and Atmospheric Administration weather station (National Oceanic and Atmospheric Administration 2014). Habitat covariates were obtained via our habitat surveys outlined above. Due to limited sample size, we selected a small set of habitat covariates thought to be important to Northern Myotis based on available literature. We further reduced the number of variables because several were highly correlated. Habitat variables included in occupancy models were average live standing overstory tree density, live standing overstory tree DBH, dead standing overstory tree density, and dead standing overstory tree DBH and were included in the occupancy term of all models (Table 6). We selected the top detection model for each species and included the survey covariate, covariates, or lack of covariate (null model) identified in this step to then estimate occupancy as a function of site covariates. For the second step of our occupancy modeling approach, we fitted 5 *a priori* models for each species (Table 9). We selected the top model using AIC. For this report, we only present occupancy analysis results for site-scale plots.

RESULTS

Mist Net Surveys

In 2014, we conducted 11 nights of mist-netting. We captured 105 bats representing 9 species (Tables 4 and 5). The most commonly captured species was the Little Brown Myotis, comprising 25.7% of all captures. We also captured 23 Northern Myotis, comprising 21.9% of all captures. Other commonly captured species included Silver-haired Bat, Long-legged Myotis, and Big Brown Bat, making up 17.1%, 10.4%, and 8.6% respectively of all captures. Overall, sex ratios were skewed towards males (90 males: 15 females). We captured pregnant females of Long-legged Myotis and Northern Myotis. Examination of membranes of both wings and the uropatagium did not reveal any evidence of WNS.

Acoustic Surveys

A total of 72 acoustic surveys were conducted in 2014. From these, a total of 4,134 recordings were made that could be classified to species. These recordings represented 11 species (Table 4). The most frequently detected species was the Little Brown Myotis followed by Silver-haired Bat and Hoary Bat. Two species, Fringed Myotis and Townsend's Big-eared Bat were documented from acoustic recordings alone in 2014.

Occupancy Analyses

The best detection function for most species was the null model. In other words, these models did not include any survey covariates indicating that detection did not differ throughout the field season, if there was precipitation during the survey night, or with minimum temperature during the survey night (Table 8). Three species included at least one survey covariate in the top detection function (Table 8). The probability of detecting Eastern Red Bat was higher when the minimum temperature his higher than average and at later Julian dates. The probability of detecting both Hoary Bat and Townsend's Big-eared Bat was higher at later Julian Dates.

We were able to estimate occupancy probabilities for nine of the eleven bat species detected in 2014 (Table 10). For Big Brown Bat, the top model was the dead tree model. This model suggested that occupancy of Big Brown Bat increased with decreasing density of live trees and with increasing density of dead trees. The second ranked model was the live tree model which also had considerable weight and suggested that occupancy increased with increasing density of live trees of small diameter. The top model for Eastern Red Bat was the dead tree model and indicated that occupancy decreased with the density and DBH of dead trees. The tree density model also had considerable support and suggested that occupancy increased with decreasing density of both live and dead trees. The null model was the highest ranked model for Hoary Bat. However, all models had at least some support and generally indicated that occupancy increased with decreased DBH and increased with decreased density of live and dead trees. The null model was also the highest ranked model for Little Brown Bat. The dead tree model also had support and indicated that occupancy increased with decreasing density and DBH of dead trees. The null model was the highest ranked model for Silver-haired Bat and all other models had relatively little support. The live tree model was the highest ranked model for Northern Myotis. This model suggested that occupancy increased with the density of live trees and with the DBH of live trees. The DBH model was the second ranked model and also had considerable support and suggested that occupancy increased with increasing DBH of both live and dead trees. The top model for Townsend's Big-eared Bat was the null model, however the DBH model also had considerable support and suggested that occupancy of the species increased with increasing DBH of both dead and live trees. The DBH model was the highest ranked model for Western Small-footed Myotis and suggested that occupancy increased with decreasing DBH of both dead and live trees. The live tree model had almost as much support and indicated that occupancy increased with decreasing density and decreasing DBH of live trees. The top model for Western Long-eared Myotis was the null model. All other models had relatively little support.

DISCUSSION

Mist Net Surveys

Mist net surveys in 2014 were quite successful. Precipitation during the summer of 2014 was much higher than average. Much of this precipitation occurred during severe thunderstorms, limiting the number of mist net surveys we could complete. As with many bat surveys conducted in the region and in Wyoming, Little Brown Myotis was the most frequently observed species with 27 total captures (Griscom and Keinath 2011, Griscom et al. 2012). However, we captured nearly as many Northern Myotis (23) during mist net surveys suggesting that the species is relatively common in suitable habitat within the study area. The fact that very few records of the species in Wyoming had been documented prior to this study highlights the importance of continued species inventories in areas and habitats that have received little survey effort.

Another important finding from mist net surveys was the presence of reproductively active females of two species, Long-legged Myotis and Northern Myotis (Table 5), indicating that we sampled in areas in the vicinity of maternity colonies of these species. We were unable to confirm the presence of juvenile individuals in 2014. This is possibly because we conducted mist net surveys early in season when females were pregnant and later in the summer when juvenile bats may be more difficult to distinguish from adults. This discrepancy between the observations of reproductively active female bats but few juvenile bats may result from several additional circumstances. For example, we may have sampled in areas unsuitable for raising offspring later in the summer when juveniles were volant. Because bats have extremely low fecundity, raising only one pup annually, it is extremely important to understand where female bats raise their young. Additionally, while pregnant and while raising offspring, female bats select very specific roosting habitats (Adams 2003, Harvey et al. 2011) and females of many bat species congregate in maternity colonies that represent a very important component of the local bat community (Adams 2003). In the context of land management activities, such as timber harvest, that occur in the Black Hills and Bear Lodge Mountains, it is important to identify areas where female bats raise young. A logical next step would be to identify the specific locations of maternity roosts that are being used in these areas. This could be accomplished by radio tagging reproductively active female bats and tracking them to day roosts or by trying to model suitable roosting habitat across the study area.

Acoustic Surveys

Acoustic surveys continue to be a very efficient survey method, accounting for the vast majority of occurrences in 2014. The most frequently detected species was Little Brown Myotis. Contrary to our mist net survey results, we only had 17 detections of Northern Myotis. This is likely in part due to the fact that Northern Myotis echolocates quietly, meaning that the bat must be relatively close to the microphone to be recorded. Additionally, echolocation calls of Northern Myotis are similar to those emitted by other Myotis species such as Long-legged Myotis. As a result, discretion should be used when evaluating echolocation recordings of these species. Also, our acoustic survey locations were randomly selected and it is likely that not all survey locations occurred in habitat suitable for Northern Myotis while mist net surveys generally occurred in forested habitats suitable for occupancy by the species.

While acoustic surveys are effective at answering some questions, acoustic monitoring in conjunction with mist net surveys provide the best picture of species occurrence, local demographics, and allowing us to monitor disease status of bats in hand.

Occupancy Analyses

Results from occupancy analyses presented in this report are preliminary and require further evaluation. As result, conclusions drawn from these models should be viewed with caution. Occupancy models for all species were limited by the number of sites surveyed in 2014. Obtaining a larger sample size will allow us to include a larger set of habitat covariates that are likely influence site occupancy. Additionally, we will utilize multi-method models using the two site-level microphones in a duel-observer approach. While this alone will not increase our sample size, these methods will provide more robust estimates of occupancy and detection probabilities which will in turn allow for stronger inferences regarding site occupancy and habitat features that influence occupancy across the study area (MacKenzie 2006). Occupancy analyses conducted in 2014 only include site-level plots. We will conduct occupancy analyses at the home range-scale in the future.

We attempted to include a small number of survey covariates that are known to influence bat activity and as a result, detection probability. For example, bats typically roost during precipitation events which may decrease the probability of a given bat species being detected during a night with a precipitation event. The best detection function for most species was the null model. In other words, these models did not include any survey covariates, indicating that detection did not differ throughout the field season, if there was precipitation during the survey night, or with minimum temperature during the survey night. Alternatively, detection probability may have varied with some environmental or temporal variable not included in these models. For the three species (Eastern Red Bat, Hoary Bat, and Townsend's Big-eared Bat) that included at least one survey covariate in the top detection function, model results meet our expectations. For example, the probability of detecting Eastern Red Bat was higher when the minimum temperature his higher, when bats may be more active than on cold nights, and was higher later in field season when there may be more bats on the landscape after young become volant. Also, it is possible that the probability of detecting Hoary Bat and Eastern Red Bat increased towards the end of the field season because migrating individuals may have been traveling through our study area. If this is the case, it may be appropriate to exclude data for these species collected during migration.

The top occupancy model for many species included the null model. This may suggest that our habitat covariates did not include landscape features that influenced the occupancy of some species. Our habitat surveys were designed to capture habitat variables known to be important to Northern Myotis. As a result, we may not have included habitat features that would explain occupancy for many species. Also, some species, such as Hoary Bat, were detected at most sites and had a high occupancy probability. This suggests that these species are widely distributed and may not be limited by local habitat characteristics collected during this study.

For many species, multiple models had considerable support and had delta AIC values within two units of the top model. In this case, model averaging is appropriate and may provide more robust estimates of occupancy probability. Because this is a preliminary analysis, we chose to only present detection and occupancy probabilities from the top model for each species.

Most importantly, occupancy modeling results for our focal species met our expectations. Specifically, the highest ranked model for Northern Myotis included covariates for the density and DBH of live trees and suggests that occupancy increased with the density of live trees and with the DBH of live trees. Northern Myotis is generally considered a forest obligate species and is typically associated with relatively dense, cluttered forest stands (Yates and Muzika 2006). The second ranked model contained covariates for the DBH of live and dead trees and also had considerable support and suggested that occupancy increased with increasing DHB of both live and dead trees. Many studies suggest that the species roosts in large trees, including one study conducted in the Black Hills of South Dakota (Cryan et al. 2001, Garroway and Broders 2008, Lacki et al. 2009). Additionally, the presence of suitable roost trees is thought to be one of the primary factors affecting the distribution of most bat species (Cryan et al. 2001).

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TABLES

Table 1. Slope position Codes and descriptions used during habitat surveys in 2014.

Code	Description
SU	**Summit/Ridgetop/Plateau**. The topographically highest hillslope position of a hillslope profile and exhibiting a nearly level surface.
SH	**Shoulder**. The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from backslope to summit.
BS	**Backslope**. The hillslope position that forms the steepest inclined surface and principle element of many hillslopes. In profile, backslopes are commonly steep, linear, and bounded by a convex shoulder above and descending to concave footslope. They may or may not include cliff segments. Backslopes are commonly erosional forms produced by mass movement and running water.
FS	**Footslope**. The hillslope position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. It is a transition zone between upslope sites of erosion and transport.
TS	**Toeslope**. The hillslope position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear, and are constructional surfaces forming the lower part of a hillslope continuum that grades to a valley bottom.
VB	**Valley Bottom**. Wide valley bottom beyond influence of toeslope.

Table 2. Tree codes and descriptions used during habitat surveys in 2014.

Code	Description
LSO	Live Standing Overstory (Standing live tree >3 m tall)
DSO	Dead Standing Overstory (Standing dead tree >3 m tall; i.e. Snag)
LSU	Live Standing Understory (Standing live tree <3 m tall)
DSU	Dead Standing Understory (Standing dead tree <3 m tall)

Table 3. Snag decay codes and information regarding classes.

Snag Decay Code	Bark	Heartwood Decay	Sapwood Decay	Limbs	Top Breakage	Bole Form	Time Since Death
1*	Tight, intact	Minor	None to incipient	Mostly Present	May be present	Intact	≤5 years
2	50% loose or missing	None to advanced	None to incipient	Small limbs missing	May be present	Intact	>5 years
3	75% missing	Incipient to advanced	None to 25%	Few remain	Approx. 1/3	Mostly intact	>5 years
4	75% missing	Incipient to advanced	25%+	Few remain	Approx. 1/3 to ½	Losing form, soft	>5 years
5	75%+ missing	Advanced to crumbly	50%+ advanced	Absent	Approx. ½+	Form mostly lost	>5 years

Table 4. Bat species captured in mist nets and detected via acoustic recordings in 2014 in northeastern Wyoming, their relative abundance throughout the study area and seasonal residency.

Common name	Scientific name	Relative abundance	Mist net Captures	Acoustic Recordings	Season of residency
Big Brown Bat	*Eptesicus fuscus*	Common	9	548	Year round
Eastern Red Bat	*Lasiurus borealis*	Uncommon	1	13	Spring, summer, fall
Fringed Myotis	*Myotis thysanodes*	Uncommon	0	4	Year round
Hoary Bat	*Lasiurus cinereus*	Common	7	725	Spring, summer, fall
Little Brown Myotis	*Myotis lucifugus*	Common	27	1558	Year round
Long-legged Myotis	*Myotis volans*	Common	11	6	Year round
Northern Long-eared Myotis	*Myotis septentrionalis*	Common	23	17	Year round*
Silver-haired Bat	*Lasionycteris noctivagans*	Common	18	760	Spring, summer, fall
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Uncommon	0	36	Year round
Western Long-eared Myotis	*Myotis evotis*	Common	7	223	Year round
Western Small-footed Myotis	*Myotis ciliolabrum*	Uncommon	2	246	Year round

*There are no known Northern Long-eared Myotis hibernacula in Wyoming and it is currently unknown if they hibernate in the state.

Table 5. Number of bats captured during 2014 mist net surveys by sex, reproductive status, and age.

Species	Males (repro[1])	Females (repro[2])	Adults	Juveniles
Big Brown Bat	9 (1)	0 (0)	9	0
Eastern Red Bat	0 (0)	1 (0)	1	0
Hoary Bat	0 (0)	7 (0)	7	0
Little Brown Myotis	26 (0)	1(0)	27	0
Northern Long-eared Myotis	18(0)	5(4)	23	0
Western Long-eared Myotis	7(0)	0 (0)	7	0
Long-legged Myotis	6 (0)	5 (1)	11	0
Silver-haired Bat	16 (3)	2 (0)	18	0
Western Small-footed Myotis	2 (0)	0 (0)	2	0

[1] Number of males with descended testis.

[2] Number of females pregnant, lactating, or post-lactating.

Table 6. Site and survey covariates used in occupancy models. All variables were standardized so that the mean was equal to zero.

Variable	**Definition**
MC_S_LSO_D	Density of live overstory trees
MC_S_DBH	Diameter at Breast Height of live overstory trees
MC_S_DSO_D	Density of dead overstory trees
MC_S_DSO_DBH	Diameter at Breast Height of dead overstory trees
MC_MinT	Minimum temperature during survey night
pp	1=measureable precipitation occurred; 0=no measureable precipitation occurred during survey night
MC_JD	Julian date of survey night

Table 7. Set of eight *a priori* models used to optimize detection functions for each bat species where ψ = occupancy probability and p = detection probability.

Model
Ψ (MC_S_LSO_D + MC_S_DBH + MC_S_DSO_D + MC_S_DSO_DBH), p (.)
Ψ (MC_S_LSO_D + MC_S_DBH + MC_S_DSO_D + MC_S_DSO_DBH), p (MC_MinT)
Ψ (MC_S_LSO_D + MC_S_DBH+MC_S_DSO_D + MC_S_DSO_DBH), p (pp)
Ψ (MC_S_LSO_D + MC_S_DBH+MC_S_DSO_D + MC_S_DSO_DBH), p (MC_JD)
Ψ (MC_S_LSO_D + MC_S_DBH + MC_S_DSO_D + MC_S_DSO_DBH), p (MC_MinT + pp)
Ψ (MC_S_LSO_D + MC_S_DBH + MC_S_DSO_D + MC_S_DSO_DBH), p (MC_MinT + MC_JD)
Ψ (MC_S_LSO_D + MC_S_DBH + MC_S_DSO_D + MC_S_DSO_DBH), p (MC_MinT + pp)
Ψ (MC_S_LSO_D + MC_S_DBH + MC_S_DSO_D + MC_S_DSO_DBH), p (MC_MinT + pp + MC_JD)

Table 8. Survey covariates included in the top detection probability model for each of eight bat species in 2014.

Species	Survey covariate
Big Brown Bat	p (.)
Eastern Red Bat	p (MC_MinT + MC_JD)
Hoary Bat	p (MC_JD)
Little Brown Myotis	p (.)
Northern Long-eared Myotis	p (.)
Silver-haired Bat	p (.)
Townsend’s Big-eared Bat	p (MC_JD)
Western Long-eared Myotis	p (.)
Western Small-footed Myotis	p (.)

Table 9. Set of five candidate models used to model occupancy probability for each bat species where ψ = occupancy probability. The detection probability (p) function for each species included the survey covariate(s) identified in Table 8 above.

Model Name	Model
Null	Ψ (.)
Tree stem density	Ψ (MC_S_LSO_D + MC_S_DSO_D)
DBH	Ψ (MC_S_LSO_DBH + MC_S_DBH)
Live tree	Ψ (MC_S_LSO_D + MC_S_DBH)
Dead tree	Ψ (MC_S_DSO_D + MC_S_DSO_DBH)

Table 10. Occupancy probability, detection probability, and standard errors from the top model for each species.

Common name	Scientific name	Occupancy Probability	SE	Detection Probability	SE
Big Brown Bat	*Eptesicus fuscus*	0.853	0.077	0.614	0.061
Eastern Red Bat	*Lasiurus borealis*	0.627	0.801	0.721	0.412
Hoary Bat	*Lasiurus cinereus*	0.908	0.067	0.680	0.056
Little Brown Myotis	*Myotis lucifugus*	0.566	0.399	0.574	0.309
Northern Long-eared Myotis	*Myotis septentrionalis*	0.489	0.202	0.273	0.094
Silver-haired Bat	*Lasionycteris noctivagans*	0.868	0.424	0.677	0.292
Townsend's Big-eared Bat	*Corynorhinus townsendii*	0.434	0.130	0.392	0.097
Western Long-eared Myotis	*Myotis evotis*	0.713	0.435	0.521	0.283
Western Small-footed Myotis	*Myotis ciliolabrum*	0.241	0.510	0.003	0.439

FIGURES

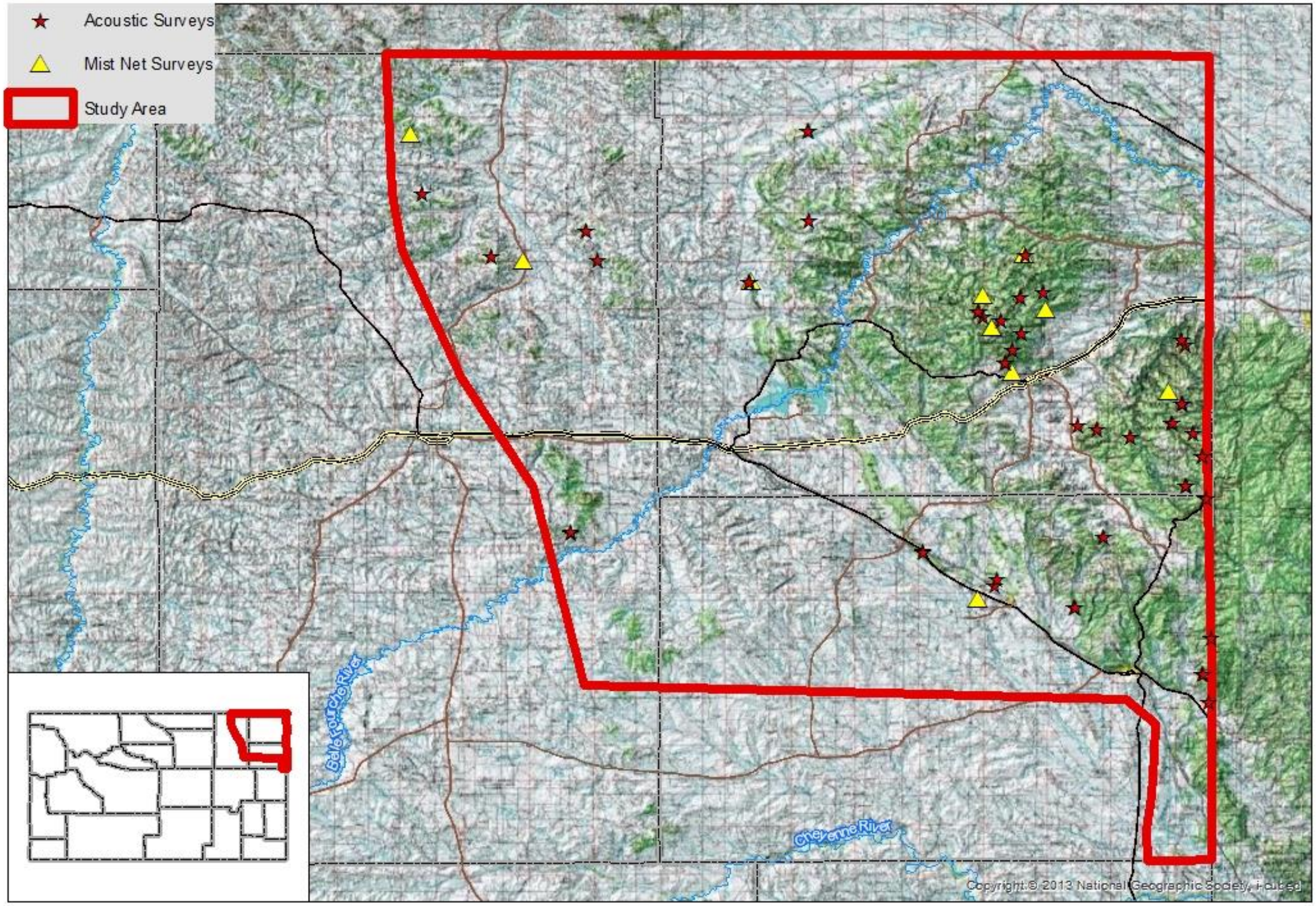

Figure1. Study area, mist net and acoustic survey locations sampled in 2014.

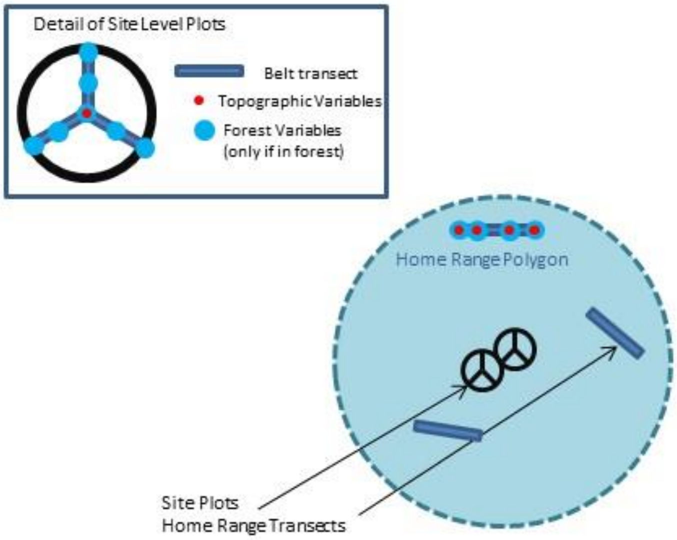

Figure 2. Schematic of site-scale and home range-scale plots that comprised our habitat surveys in 2014.

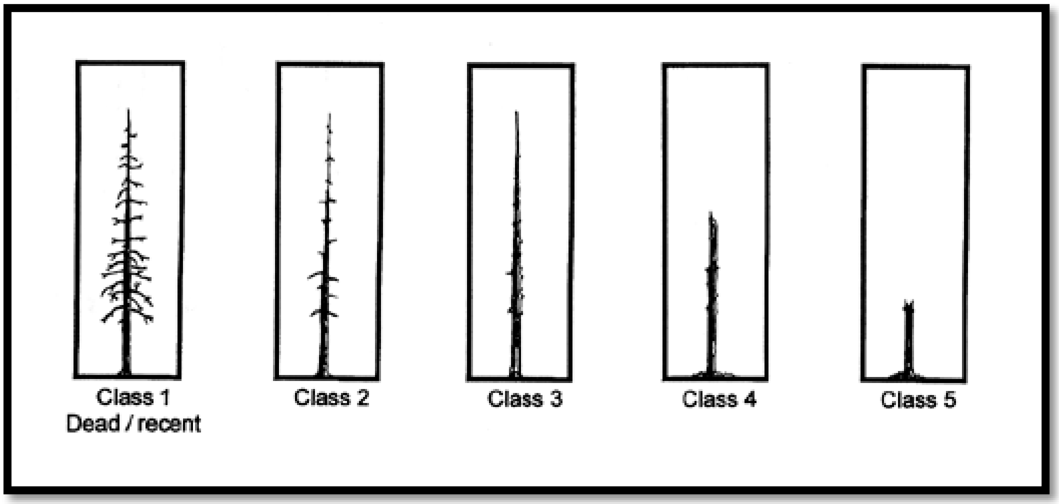

Figure 3. Illustration of snag decay classes.

APPENDDICES

Appendix 1: 2014 Mist Net Captures

Locality	Survey Date	Species	Capture Time	Sex	Age	Repro	FA	E	Wt	Keel	WDI	Wylam Easting	Wylam Northing
Turtle Rock	7/9/2014	MYVO	2115	M	A	N	38	8	8	Yes	0	677789	220255
Turtle Rock	7/9/2014	MYLU	2230	M	A	N	32	11.5	5	No	0P	677790	220255
Turtle Rock	7/9/2014	MYEV	2204	M	A	N	39.5	10	11	No	0P	677788	220255
Turtle Rock	7/9/2014	EPFU	2312	M	A	N	45.9	13	16.5	Yes	0P	677785	220254
Turtle Rock	7/9/2014	EPFU	2335	M	A	N	45.5	14	15	Yes	0P	677789	220257
Turtle Rock	7/9/2014	MYVO	2251	M	A	N	39	12	7	Yes	0P	677788	220259
Turtle Rock	7/9/2014	MYVO	2250	M	A	N	37.5	10	5	Yes	0P	677787	220257
Turtle Rock	7/9/2014	LANO	2320	M	A	N	42	11	12	No	0	677787	220255
Turtle Rock	7/10/2014	MYLU	2410	M	A	N	37	14	6.5	No	0P	677786	220259
Stanton Draw	7/13/2014	LANO	2253	M	A	N	40.9	9	-	No	0	771442	559459
Stanton Draw	7/13/2014	MYVO	2200	M	A	N	-	-	7.5	Yes	0	771444	559463
Stanton Draw	7/13/2014	MYSE	2200	F	A	P	34.5	15	9	No	0	771444	559463
Stanton Draw	7/13/2014	LANO	2200	M	A	N	-	-	12	No	0	771444	559462
Stanton Draw	7/13/2014	MYVO	2200	M	A	N	-	-	-	Yes	0	771444	559463
Stanton Draw	7/13/2014	LACI	2220	M	A	N	-	-	-	No	0	771445	559463
Stanton Draw	7/13/2014	MYVO	2222	F	A	P	-	-	-	Yes	0	771445	559463
Stanton Draw	7/13/2014	MYSE	2220	M	A	N	-	-	-	No	0	771443	559463
Stanton Draw	7/13/2014	EPFU	2220	M	A	N	-	-	-	No	0	771443	559463
Stanton Draw	7/13/2014	MYSE	2220	M	A	N	-	-	-	No	0	771443	559463

Locality	Survey Date	Species	Capture Time	Sex	Age	Repro	FA	E	Wt	Keel	WDI	Wylam Easting	Wylam Northing
Stanton Draw	7/13/2014	MYSE	2224	M	A	N	-	-	5.8	No	0	771442	559463
Stanton Draw	7/13/2014	MYSE	2224	M	A	N	38.6	11	-	No	0	771443	559463
Stanton Draw	7/13/2014	MYSE	2224	M	A	N	-	-	-	No	0P	771443	559463
Stanton Draw	7/13/2014	LANO	2330	M	A	N	40.2	12	12..5	No	0	771445	559462
Stanton Draw	7/13/2014	LANO	2332	M	A	N	42	11	11	No	0	771442	559462
Stanton Draw	7/13/2014	LANO	2332	M	A	N	42	11	11	No	0	771437	559460
Stanton Draw	7/13/2014	LACI	2343	M	A	N	52.4	11	-	No	0	771445	559463
Stanton Draw	7/13/2014	LANO	2350	M	A	N	37.3	10	9	No	0	771443	559462
Stanton Draw	7/13/2014	MYSE	2350	M	A	N	37.3	10	8	No	0	771441	559460
Stanton Draw	7/13/2014	MYSE	2350	M	A	N	37.3	10	8	No	0	771442	559460
Stanton Draw	7/13/2014	MYSE	2350	M	A	N	35.2	14	3	No	0	771450	559460
Stanton Draw	7/13/2014	MYVO	2122	F	A	N	38.2	10	7	Yes	0P	771441	559463
Stanton Draw	7/13/2014	MYVO	2127	F	A	N	37	10	8	Yes	0	771442	559460
Stanton Draw	7/13/2014	MYSE	2130	M	A	N	35.8	11	5.5	No	0P	771442	559461
Stanton Draw	7/13/2014	LANO	2135	M	A	N	-	-	-	No	0	771438	559455
Stanton Draw	7/13/2014	LANO	2140	M	A	N	-	-	-	No	0P	771441	559461
Stanton Draw	7/13/2014	LACI	2132	M	A	N	46.5	13	47	No	0P	771443	559462

Locality	Survey Date	Species	Capture Time	Sex	Age	Repro	FA	E	Wt	Keel	WDI	Wylam Easting	Wylam Northing
Stanton Draw	7/13/2014	MYVO	2145	F	A	N	38.5	11	10	Yes	0P	771447	559463
Stanton Draw	7/13/2014	MYSE	2208	F	A	N	37.5	15	8.5	No	0P	771446	559464
Stanton Draw	7/13/2014	EPFU	2230	M	A	D	-	-	-	No	0P	771444	559460
Stanton Draw	7/13/2014	LANO	2239	M	A	D	-	-	-	No	0P	771450	559457
Stanton Draw	7/13/2014	LANO	2245	M	A	D	-	-	-	No	0	771448	559459
Whitelaw Crk	7/24/2014	MYVO	2108	M	A	N	39.1	12	8	Yes	0P	741494	592252
Whitelaw Crk	7/24/2014	MYEV	2112	M	A	N	40.6	17	0	No	0P	741487	592254
Whitelaw Crk	7/24/2014	MYCI	2148	M	A	N	35.9	10	6	No	0P	741493	592257
Whitelaw Crk	7/24/2014	MYCI	2125	M	A	N	35.9	10	6	No	0P	741464	592248
Whitelaw Crk	7/24/2014	MYSE	2130	M	A	N	35.5	14	5	No	0P	741465	592248
Whitelaw Crk	7/24/2014	LACI	2135	M	A	N	-	-	-	No	0P	741467	592244
Whitelaw Crk	7/24/2014	MYSE	2153	M	A	N	34.9	15	5	No	0P	741467	592241
Whitelaw Crk	7/24/2014	MYLU	2207	M	A	N	36.8	12	8	No	0P	741466	592240
Whitelaw Crk	7/24/2014	MYSE	2044	M	A	N	35.9	15	6.5	No	0P	741467	592252
Whitelaw Crk	7/24/2014	MYVO	2255	F	A	N	38.5	11	-	Yes	0P	741466	592251
Blacktail Crk	8/16/2014	MYLU	2029	M	A	N	34.4	11	7	No	0P	739880	598805
Blacktail Crk	8/16/2014	MYLU	2035	M	A	N	37.5	11	-	No	0P	739877	598806

Locality	Survey Date	Species	Capture Time	Sex	Age	Repro	FA	E	Wt	Keel	WDI	Wylam Easting	Wylam Northing
Blacktail Crk	8/16/2014	LANO	2035	M	A	N	-	-	-	No	0P	739880	598802
Blacktail Crk	8/16/2014	MYEV	2045	M	A	N	38.8	18	6.5	No	0P	739880	598804
Blacktail Crk	8/16/2014	EPFU	2050	M	A	N	-	-	16	No	0P	739881	598803
Blacktail Crk	8/16/2014	LACI	2115	M	A	N	54.4	-	-	No	0P	739936	598735
Blacktail Crk	8/16/2014	LANO	2024	F	A	N	-	-	11	No	0	739878	598808
Blacktail Crk	8/16/2014	LANO	2120	M	A	D	-	-	-	No	0	739878	598803
Beaver Crk	8/17/2014	MYLU	2012	M	A	N	-	-	6.5	No	0P	745808	607462
Beaver Crk	8/17/2014	MYLU	2020	M	A	N	37.1	12	6.5	No	0	745810	607450
Beaver Crk	8/17/2014	MYLU	2045	M	A	N	36	13	6	No	0	745808	607460
Beaver Crk	8/17/2014	MYLU	2030	M	A	N	36.5	13	7	No	0	745804	607459
Beaver Crk	8/17/2014	MYLU	2030	M	A	N	37.8	14	6	No	0P	745810	607459
Beaver Crk	8/17/2014	MYLU	2040	M	A	N	38	13	7	No	0	745808	607462
Beaver Crk	8/17/2014	MYSE	2130	M	A	N	35.1	16	7	No	0	745806	607466
Beaver Crk	8/17/2014	EPFU	2133	M	A	N	-	-	-	No	0	745808	607465
Beaver Crk	8/17/2014	MYLU	2135	M	A	N	37.4	13	8	No	0	745800	607461
Beaver Crk	8/17/2014	MYLU	2142	M	A	N	36.6	12	-	No	0P	745812	607462
Beaver Crk	8/17/2014	EPFU	2149	M	A	N	-	-	-	No	0	745811	607469
Beaver Crk	8/17/2014	EPFU	2151	M	A	N	-	-	-	No	0	745809	607466
Beaver Crk	8/17/2014	MYLU	2015	M	A	N	36.5	13	6.5	No	0P	745805	607464
Beaver Crk	8/17/2014	MYEV	2159	M	A	N	36	20	-	No	0	745807	607466
Beaver Crk	8/17/2014	LANO	2040	M	A	N	-	-	-	No	0P	745804	607466
Beaver Crk	8/17/2014	MYLU	2020	M	A	N	36.8	12	6.5	No	0P	745805	607469
Beaver Crk	8/17/2014	MYLU	2220	M	A	N	38.5	12	8.5	No	0	745806	607469
Beaver Crk	8/17/2014	MYSE	2222	M	A	N	34.2	16	25	No	0	745805	607475

Locality	Survey Date	Species	Capture Time	Sex	Age	Repro	FA	E	Wt	Keel	WDI	Wylam Easting	Wylam Northing
Beaver Crk	8/17/2014	EPFU	2225	M	A	N	-	-	-	No	0P	745809	607474
Beaver Crk	8/17/2014	MYLU	2226	M	A	N	37.3	13	-	No	0	745805	607471
Beaver Crk	8/17/2014	MYLU	2030	F	A	N	37.9	13	6.5	No	0P	745800	607463
Beaver Crk	8/17/2014	MYLU	2030	M	A	N	-	13	-	No	0P	745803	607467
Beaver Crk	8/17/2014	MYLU	2030	M	A	N	38.1	13	-	No	0P	745801	607466
Bear Lake	8/29/2014	MYEV	2010	M	A	N	35.2	-	5	No	0	768150	579916
Bear Lake	8/29/2014	MYLU	2005	M	A	N	37	13	6	No	0P	768147	579924
Bear Lake	8/29/2014	MYLU	2000	M	A	N	36.8	10	6	No	0P	768148	579922
Bear Lake	8/29/2014	MYLU	2009	M	A	N	36	12	6.5	No	0	768150	579921
Bear Lake	8/29/2014	MYLU	2005	M	A	N	36.9	15	7	No	0P	768148	579920
Bear Lake	8/29/2014	MYLU	2005	M	A	N	36.6	16	8.5	No	0P	768148	579920
Bear Lake	8/29/2014	MYEV	1930	M	A	N	36.7	16	6	No	0P	768149	579923
Bear Lake	8/29/2014	MYLU	2043	M	A	N	36.5	15	9	No	0P	768148	579925
Bear Lake	8/29/2014	MYLU	2050	M	A	N	37.9	14	-	No	0P	768150	579923
Bear Lake	8/29/2014	MYEV	2045	M	A	N	34.6	18	6.5	No	0P	768148	579924
Bear Lake	8/29/2014	MYSE	2050	M	A	N	36.7	16	6	No	0P	768148	579925
Bear Lake	8/29/2014	MYSE	2100	M	A	N	36	16	7	No	0	768149	579920
Bear Lake	8/29/2014	MYSE	2110	F	A	L	37.7	15	-	No	0P	768148	579921
Bear Lake	8/29/2014	LACI	2105	M	A	N	-	-	-	No	0P	768148	579918
Bear Lake	8/29/2014	MYSE	2130	F	A	L	36.6	16	-	No	0	768148	579910
Bear Lake	8/29/2014	LABO	2130	F	A	N	40.2	10	15	No	0	768153	579927
Bear Lake	8/29/2014	LANO	2142	M	A	N	43	11	13	No	0	768148	579917
Bear Lake	8/29/2014	MYSE	2140	F	A	L	35.1	17	-	No	0P	768150	579919
Bear Lake	8/29/2014	MYSE	2152	M	A	N	36.3	15	-	No	0	768151	579922
Bear Lake	8/29/2014	LANO	2200	M	A	N	41.1	10	-	No	0	768149	579918
Bear Lake	8/29/2014	LANO	2215	F	A	N	42.9	11	-	No	0	768146	579937
Bear Lake	8/29/2014	MYSE	2210	M	A	N	33.1	17	-	No	0P	768148	579922
Bear Lake	8/29/2014	LACI	2228	F	A	N	-	-	-	No	0	768149	579919

Appendix 2: 2014 Acoustic Monitoring Detections

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
Peterson Spring	08/04/2014	LACI	1	745856	591183
Peterson Spring	08/04/2014	MYEV	2	745856	591183
Wild Horse Creek	08/06/2014	LACI	13	681039	610419
Wild Horse Creek	08/06/2014	MYEV	2	681039	610419
Wild Horse Creek	08/06/2014	MYTH	1	681039	610419
Pine Ridge Oshoto	07/31/2014	EPFU	23	705374	600474
Pine Ridge Oshoto	07/31/2014	LACI	6	705374	600474
Pine Ridge Oshoto	07/31/2014	LANO	2	705374	600474
Pine Ridge Oshoto	07/31/2014	MYCI	2	705374	600474
Pine Ridge Oshoto	07/31/2014	MYLU	11	705374	600474
Cedar Draw	07/11/2014	EPFU	1	776545	516414
Cedar Draw	07/11/2014	LACI	3	776545	516414
Cedar Draw	07/11/2014	LANO	4	776545	516414
Four Corners Road	08/24/2014	MYCI	6	680389	548066
Four Corners Road	08/24/2014	MYLU	1	680389	548066
Willow Spring	07/20/2014	EPFU	1	768815	573676
Willow Spring	07/20/2014	LACI	1	768815	573676
Willow Spring	07/20/2014	MYEV	2	768815	573676
Oil Creek	08/16/2014	COTO	9	759674	549644
Oil Creek	08/16/2014	LANO	2	759674	549644
Oil Creek	08/16/2014	MYLU	1	759674	549644
Hardy Gaurd Station	07/11/2014	LACI	2	774496	558242
Hardy Gaurd Station	07/11/2014	LANO	1	774496	558242
Hardy Gaurd Station	07/11/2014	MYSE	1	774496	558242
Carson Draw	07/23/2014	COTO	1	743738	585037
Carson Draw	07/23/2014	MYLU	1	743738	585037
Spring Creek	08/06/2014	EPFU	2	682893	604409
Spring Creek	08/06/2014	LACI	18	682893	604409
Spring Creek	08/06/2014	LANO	1	682893	604409
Spring Creek	08/06/2014	MYCI	3	682893	604409
Spring Creek	08/06/2014	MYEV	4	682893	604409
Spring Creek	08/06/2014	MYLU	1	682893	604409
Beaver Creek	08/12/2014	LACI	13	745400	598689
Horse Creek	08/03/2014	LANO	1	656688	617335
Corral Spring	08/13/2014	EPFU	14	740028	594494
Corral Spring	08/13/2014	LACI	4	740028	594494
Corral Spring	08/13/2014	LANO	13	740028	594494
Corral Spring	08/13/2014	MYCI	3	740028	594494

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
Corral Spring	08/13/2014	MYLU	7	740028	594494
Adams Canyon	07/20/2014	EPFU	3	754928	572653
Adams Canyon	07/20/2014	LACI	5	754928	572653
Adams Canyon	07/20/2014	LANO	1	754928	572653
Kellog Trail	07/10/2014	EPFU	1	743853	539054
Kellog Trail	07/10/2014	LACI	2	743853	539054
Kellog Trail	07/10/2014	LANO	1	743853	539054
Kellog Trail	07/10/2014	MYCI	1	743853	539054
Kinney Canyon	07/19/2014	EPFU	1	776392	529539
Kinney Canyon	07/19/2014	LACI	1	776392	529539
Kinney Canyon	07/19/2014	LANO	3	776392	529539
Kinney Canyon	07/19/2014	MYSE	1	776392	529539
Dugout Gulch	08/25/2014	EPFU	1	769532	590810
Dugout Gulch	08/25/2014	LACI	2	769532	590810
Dugout Gulch	08/25/2014	MYCI	1	769532	590810
Moskee Road	08/18/2014	LACI	3	762786	570571
Moskee Road	08/18/2014	LANO	14	762786	570571
Forest Road 873	08/29/2014	LANO	2	773501	566995
Whitelaw Creek	08/04/2014	EPFU	1	742796	593788
Whitelaw Creek	08/04/2014	LACI	1	742796	593788
Whitelaw Creek	08/04/2014	MYEV	4	742796	593788
Whitelaw Creek	08/04/2014	MYLU	3	742796	593788
Weston Hills	08/02/2014	LACI	1	667231	604790
Fish Canyon	08/18/2014	COTO	2	757705	571926
Fish Canyon	08/18/2014	EPFU	4	757705	571926
Fish Canyon	08/18/2014	LACI	1	757705	571926
Fish Canyon	08/18/2014	LANO	2	757705	571926
Fish Canyon	08/18/2014	MYEV	1	757705	571926
Pine Ridge Upton	07/25/2014	EPFU	1	732902	545728
Pine Ridge Upton	07/25/2014	LACI	11	732902	545728
Pine Ridge Upton	07/25/2014	MYLU	68	732902	545728
Beaver Creek	08/15/2014	EPFU	32	745809	607504
Beaver Creek	08/15/2014	LACI	5	745809	607504
Beaver Creek	08/15/2014	LANO	6	745809	607504
Beaver Creek	08/15/2014	MYCI	2	745809	607504
Beaver Creek	08/15/2014	MYEV	3	745809	607504
Beaver Creek	08/15/2014	MYLU	61	745809	607504
Winchester Creek	08/13/2014	EPFU	4	739377	595581
Winchester Creek	08/13/2014	LACI	4	739377	595581
Winchester Creek	08/13/2014	LANO	15	739377	595581

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
Winchester Creek	08/13/2014	MYEV	23	739377	595581
Winchester Creek	08/13/2014	MYLU	1	739377	595581
Winchester Creek	08/13/2014	MYSE	3	739377	595581
Lost Canyon	08/29/2014	LACI	1	771416	560828
Lost Canyon	08/29/2014	MYEV	1	771416	560828
North Redwater Creek	08/12/2014	COTO	4	748762	599921
North Redwater Creek	08/12/2014	EPFU	3	748762	599921
North Redwater Creek	08/12/2014	LACI	7	748762	599921
North Redwater Creek	08/12/2014	LANO	6	748762	599921
North Redwater Creek	08/12/2014	MYEV	14	748762	599921
North Redwater Creek	08/12/2014	MYLU	1	748762	599921
Barnard Creek	08/01/2014	EPFU	72	713811	613386
Barnard Creek	08/01/2014	LACI	179	713811	613386
Barnard Creek	08/01/2014	LANO	8	713811	613386
Barnard Creek	08/01/2014	MYCI	17	713811	613386
Barnard Creek	08/01/2014	MYEV	6	713811	613386
Barnard Creek	08/01/2014	MYLU	560	713811	613386
Little Missouri River	08/01/2014	EPFU	1	713027	631906
Little Missouri River	08/01/2014	LACI	2	713027	631906
Little Missouri River	08/01/2014	MYEV	3	713027	631906
Turtle Rock	07/09/2014	EPFU	15	677790	220256
Turtle Rock	07/09/2014	LACI	12	677790	220256
Turtle Rock	07/09/2014	LANO	42	677790	220256
Turtle Rock	07/09/2014	MYCI	2	677790	220256
Turtle Rock	07/09/2014	MYEV	5	677790	220256
Willow Spring	07/20/2014	EPFU	2	768861	573670
Willow Spring	07/20/2014	MYLU	1	768861	573670
Willow Spring	07/20/2014	MYSE	1	768861	573670
Summit View Lookout	07/12/2014	EPFU	2	775491	522006
Summit View Lookout	07/12/2014	MYCI	1	775491	522006
Summit View Lookout	07/12/2014	MYEV	1	775491	522006
Oil Creek	08/16/2014	EPFU	38	759639	549626
Oil Creek	08/16/2014	LACI	24	759639	549626
Oil Creek	08/16/2014	LANO	76	759639	549626

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
Oil Creek	08/16/2014	MYLU	3	759639	549626
Oil Creek	08/16/2014	MYTH	2	759639	549626
Hardy Gaurd Station	07/11/2014	LACI	7	774451	558260
Carson Draw	07/23/2014	COTO	1	743712	585011
Carson Draw	07/23/2014	EPFU	3	743712	585011
Carson Draw	07/23/2014	MYEV	2	743712	585011
Carson Draw	07/23/2014	MYSE	1	743712	585011
Peterson Spring	08/04/2014	LACI	3	745876	591149
Peterson Spring	08/04/2014	MYSE	1	745876	591149
Spring Creek	08/06/2014	COTO	1	682899	604442
Spring Creek	08/06/2014	EPFU	3	682899	604442
Spring Creek	08/06/2014	LACI	2	682899	604442
Spring Creek	08/06/2014	LANO	1	682899	604442
Spring Creek	08/06/2014	MYCI	17	682899	604442
Beaver Creek	08/12/2014	EPFU	29	745389	598646
Beaver Creek	08/12/2014	LACI	59	745389	598646
Beaver Creek	08/12/2014	LANO	69	745389	598646
Beaver Creek	08/12/2014	MYCI	2	745389	598646
Beaver Creek	08/12/2014	MYEV	41	745389	598646
Beaver Creek	08/12/2014	MYLU	345	745389	598646
Beaver Creek	08/12/2014	MYSE	4	745389	598646
Horse Creek	08/03/2014	EPFU	4	656646	617323
Horse Creek	08/03/2014	LANO	1	656646	617323
Horse Creek	08/03/2014	MYCI	2	656646	617323
Corral Spring	08/13/2014	COTO	2	739993	594474
Corral Spring	08/13/2014	EPFU	8	739993	594474
Corral Spring	08/13/2014	LACI	4	739993	594474
Corral Spring	08/13/2014	LANO	4	739993	594474
Corral Spring	08/13/2014	MYCI	16	739993	594474
Corral Spring	08/13/2014	MYEV	9	739993	594474
Corral Spring	08/13/2014	MYLU	31	739993	594474
Corral Spring	08/13/2014	MYSE	3	739993	594474
Adams Canyon	07/20/2014	EPFU	3	754884	572640
Adams Canyon	07/20/2014	LACI	3	754884	572640
Adams Canyon	07/20/2014	LANO	4	754884	572640
Adams Canyon	07/20/2014	MYEV	1	754884	572640
Kellog Trail	07/10/2014	EPFU	3	744096	540341
Kellog Trail	07/10/2014	LACI	4	744096	540341
Kellog Trail	07/10/2014	LANO	13	744096	540341
Kellog Trail	07/10/2014	MYCI	4	744096	540341

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
Kellog Trail	07/10/2014	MYLU	16	744096	540341
Dugout Gulch	08/25/2014	LACI	14	769519	590855
Dugout Gulch	08/25/2014	LANO	4	769519	590855
Dugout Gulch	08/25/2014	MYCI	1	769519	590855
Dugout Gulch	08/25/2014	MYLU	4	769519	590855
Moskee Road	08/18/2014	COTO	2	762747	570594
Moskee Road	08/18/2014	EPFU	4	762747	570594
Moskee Road	08/18/2014	LACI	16	762747	570594
Moskee Road	08/18/2014	LANO	19	762747	570594
Moskee Road	08/18/2014	MYEV	2	762747	570594
Forest Road 873	08/29/2014	COTO	1	773544	566973
Forest Road 873	08/29/2014	LACI	2	773544	566973
Forest Road 873	08/29/2014	LANO	3	773544	566973
Forest Road 873	08/29/2014	MYCI	3	773544	566973
Forest Road 873	08/29/2014	MYSE	1	773544	566973
Whitelaw Creek	08/04/2014	EPFU	1	742842	593772
Whitelaw Creek	08/04/2014	LACI	2	742842	593772
Whitelaw Creek	08/04/2014	MYEV	3	742842	593772
Whitelaw Creek	08/04/2014	MYLU	78	742842	593772
Whitelaw Creek	08/04/2014	MYSE	1	742842	593772
Weston Hills	08/02/2014	EPFU	1	667245	604827
Weston Hills	08/02/2014	LACI	2	667245	604827
Wild Horse Creek	08/06/2014	COTO	1	681024	610404
Wild Horse Creek	08/06/2014	EPFU	6	681024	610404
Wild Horse Creek	08/06/2014	LACI	54	681024	610404
Wild Horse Creek	08/06/2014	LANO	1	681024	610404
Wild Horse Creek	08/06/2014	MYCI	2	681024	610404
Wild Horse Creek	08/06/2014	MYEV	4	681024	610404
Wild Horse Creek	08/06/2014	MYTH	1	681024	610404
Fish Canyon	08/18/2014	EPFU	1	757715	571882
Fish Canyon	08/18/2014	LACI	1	757715	571882
Fish Canyon	08/18/2014	LANO	1	757715	571882
Fish Canyon	08/18/2014	MYEV	1	757715	571882
Fish Canyon	08/18/2014	MYLU	4	757715	571882
Pine Ridge Upton	07/25/2014	EPFU	4	732877	545758
Pine Ridge Upton	07/25/2014	LACI	2	732877	545758
Pine Ridge Upton	07/25/2014	MYCI	1	732877	545758
Pine Ridge Upton	07/25/2014	MYLU	17	732877	545758
Beaver Creek	08/15/2014	COTO	9	745782	607463
Beaver Creek	08/15/2014	EPFU	36	745782	607463

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
Beaver Creek	08/15/2014	LACI	10	745782	607463
Beaver Creek	08/15/2014	LANO	2	745782	607463
Beaver Creek	08/15/2014	MYEV	15	745782	607463
Beaver Creek	08/15/2014	MYLU	17	745782	607463
North Redwater Creek	08/12/2014	LACI	8	748727	599929
North Redwater Creek	08/12/2014	LANO	5	748727	599929
North Redwater Creek	08/12/2014	MYEV	3	748727	599929
North Redwater Creek	08/12/2014	MYLU	1	748727	599929
Barnard Creek	08/01/2014	EPFU	31	713807	613338
Barnard Creek	08/01/2014	LACI	15	713807	613338
Barnard Creek	08/01/2014	LANO	2	713807	613338
Barnard Creek	08/01/2014	MYLU	101	713807	613338
Pine Ridge Oshoto	07/31/2014	COTO	1	705355	600437
Pine Ridge Oshoto	07/31/2014	EPFU	11	705355	600437
Pine Ridge Oshoto	07/31/2014	LACI	5	705355	600437
Pine Ridge Oshoto	07/31/2014	LANO	2	705355	600437
Pine Ridge Oshoto	07/31/2014	MYCI	4	705355	600437
Pine Ridge Oshoto	07/31/2014	MYEV	2	705355	600437
Pine Ridge Oshoto	07/31/2014	MYLU	4	705355	600437
Four Corners Road	08/24/2014	MYCI	2	680407	548106
Spring Creek	09/09/2014	LACI	2	653819	614588
Spring Creek	09/09/2014	MYEV	1	653819	614588
Spring Creek	09/09/2014	LACI	1	653808	614634
Spring Creek	09/09/2014	LANO	1	653808	614634
Spring Creek	09/09/2014	MYEV	1	653808	614634
Spring Creek	09/09/2014	MYLU	1	653808	614634
Little Bull Creek	06/09/2014	MYCI	8	621056	586613
Bull Creek	06/11/2014	LACI	3	617795	587519
Bull Creek	06/11/2014	LANO	3	617795	587519
Bull Creek	06/11/2014	MYCI	64	617795	587519
Mallo Camp	09/05/2014	EPFU	1	775312	546572
Mallo Camp	09/05/2014	LANO	1	775312	546572
Mallo Camp	09/05/2014	MYEV	1	775312	546572
Mallo Camp	09/05/2014	EPFU	1	775342	546594
Mallo Camp	09/05/2014	LACI	1	775342	546594
Mallo Camp	09/05/2014	MYCI	1	775342	546594
Osage Oil Field	07/12/2014	EPFU	2	741394	536112

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
Osage Oil Field	07/12/2014	LACI	2	741394	536112
Osage Oil Field	07/12/2014	LANO	2	741394	536112
Osage Oil Field	07/12/2014	MYCI	4	741394	536112
Osage Oil Field	07/12/2014	MYLU	22	741394	536112
Stanton Draw	07/13/2014	COTO	1	771443	559461
Stanton Draw	07/13/2014	EPFU	115	771443	559461
Stanton Draw	07/13/2014	LACI	130	771443	559461
Stanton Draw	07/13/2014	LANO	396	771443	559461
Stanton Draw	07/13/2014	MYCI	7	771443	559461
Stanton Draw	07/13/2014	MYEV	17	771443	559461
Stanton Draw	07/13/2014	MYLU	67	771443	559461
Stanton Draw	07/13/2014	MYVO	3	771443	559461
Helman Reservoir	07/21/2014	EPFU	8	749279	596235
Helman Reservoir	07/21/2014	LACI	11	749279	596235
Helman Reservoir	07/21/2014	LANO	8	749279	596235
Helman Reservoir	07/21/2014	MYCI	2	749279	596235
Helman Reservoir	07/21/2014	MYEV	1	749279	596235
Helman Reservoir	07/21/2014	MYLU	3	749279	596235
Whitelaw Crk	07/24/2014	EPFU	16	741467	592237
Whitelaw Crk	07/24/2014	LACI	7	741467	592237
Whitelaw Crk	07/24/2014	LANO	1	741467	592237
Whitelaw Crk	07/24/2014	MYCI	3	741467	592237
Whitelaw Crk	07/24/2014	MYEV	15	741467	592237
Whitelaw Crk	07/24/2014	MYLU	37	741467	592237
Whitelaw Crk	07/24/2014	MYVO	1	741467	592237
Pine Ridge	08/02/2014	EPFU	29	705677	600430
Pine Ridge	08/02/2014	LACI	2	705677	600430
Pine Ridge	08/02/2014	LANO	1	705677	600430
Pine Ridge	08/02/2014	MYLU	33	705677	600430
Sundance	08/06/2014	EPFU	2	744858	583098
Sundance	08/06/2014	LACI	23	744858	583098
Sundance	08/06/2014	LANO	4	744858	583098
Sundance	08/06/2014	MYCI	1	744858	583098
Sundance	08/06/2014	MYLU	48	744858	583098
New Haven	09/06/2014	EPFU	1	711045	617669
New Haven	09/06/2014	LACI	3	711045	617669
New Haven	09/06/2014	LANO	9	711045	617669
New Haven	09/06/2014	MYCI	47	711045	617669
New Haven	09/06/2014	MYEV	29	711045	617669
New Haven	09/06/2014	MYLU	4	711045	617669

Locality	Survey Date	Species	Number of Recordings	Wylam Easting	Wylam Northing
New Haven	09/06/2014	COTO	1	711841	617294
New Haven	09/06/2014	EPFU	2	711841	617294
New Haven	09/06/2014	LACI	1	711841	617294
New Haven	09/06/2014	LANO	2	711841	617294
New Haven	09/06/2014	MYCI	15	711841	617294
New Haven	09/06/2014	MYEV	3	711841	617294
New Haven	09/06/2014	MYLU	5	711841	617294
New Haven	09/06/2014	EPFU	1	711857	617334
New Haven	09/06/2014	LACI	4	711857	617334
New Haven	09/06/2014	LANO	1	711857	617334
New Haven	09/06/2014	MYCI	2	711857	617334
New Haven	09/06/2014	MYEV	1	711857	617334
New Haven	09/06/2014	MYVO	2	711857	617334